2000. The Journal of Arachnology 28:251–253

RESEARCH NOTE

HUNTING AND FEEDING BEHAVIOR OF ONE *HETEROPODA* SPECIES IN LOWLAND RAINFOREST ON BORNEO (ARANAE, SPARASSIDAE)

Keywords: *Heteropoda*, hunting behavior

Spiders in the genus *Heteropoda* Latreille 1804 (Sparassidae) are distributed in tropical Asia and Australia, with the exception of the cosmopolitan *Heteropoda venatoria* (Linnaeus 1758) (see Roewer 1954; Brignoli 1983; Platnick 1989, 1993, 1998; P. Jäger per. commun.). With the exception of the Australian species (Davis 1994), the genus *Heteropoda* as well as the entire family are unrevised (Jäger 1998). To date, two nominal species of *Heteropoda* have been described from Borneo, *H. hosei* Pocock 1897 and *H. obtusa* Thorell 1890; a generic revision is necessary to distinguish between these species (Jäger pers. commun.). *Heteropoda* sp. from lowland rainforest in Kinabalu Park (Sabah, Malaysia) were observed in the field and laboratory. Voucher specimens, including two females, one male, and two juveniles, are deposited at the Field Museum of Natural History.

Between April and July 1998, one of us (SA) conducted nightly surveys along streams in lowland rainforest (600 m elevation) near Poring Hot Springs in Kinabalu Park (Sabah, Malaysia, 6°03′N, 116°42′E). Surveys were conducted along 100 m transects at three sites in Kinabalu Park and one site in an agricultural area. Visual surveys were conducted by walking slowly along each edge of the stream, searching for spiders in, under, and on all substrates between the stream banks. We recorded the size of each spider and its position on the transect. We recorded the substrate type selected by each spider, the horizontal distance from the edge of the stream, the vertical distance from the ground, and the nearest aquatic microhabitat type.

We encountered a mean of 6.5 ± 3.1 spiders per night on 100 m stream transects in primary forest. Significantly fewer spiders (2.2 ± 1.6) occurred along streams in an agricultural area nearby (independent samples $T = 3.85$, $df = 13.5$, $P = 0.002$). Spiders were unevenly distributed, with a mean distance between spiders of 16.8 ± 18.1 m in primary forest and 19.1 ± 23.3 m in the agricultural area. Spiders exhibited stereotyped microhabitat selection. Ninety-three percent of the spiders in primary forest ($n = 154$) and 75% of the spiders in the agricultural area ($n = 22$) perched, facing downward, on boulders and small rocks at the edge of streams. In both primary forests and the agricultural area, spiders perched less than a meter from the water and the ground. On average, spiders perched a distance of 0.93 ± 1.27 m from the water in primary forest, and 0.69 ± 0.80 m in the agricultural area. Spiders perched a mean distance of 0.44 ± 0.57 m from the surface of the water or the ground in both habitats. Spiders remained motionless unless disturbed. At one instance we observed a spider jumping from its perch on a rock and diving into the water. There it remained submerged for a period of time long enough for us to lose sight of it. We did not observe prey capture in the field.

Thirteen spiders were housed in the laboratory for up to four weeks, each in 15 gallon (57 liters), clear, plastic cages with screen lids. Every five days the spiders were fed three prey items in cafeteria trials. Prey items included three species of frog larvae, *Leptobrachium montanum* (Megophryidae), *Meristogenys orphnocnemis* (Ranidae), and *Rana signata* (Ranidae), one species of fish, *Glan-*

Table 1.—Prey selection by *Heteropoda* sp. in laboratory trials.

Prey	Species	*n* offered	*n* eaten
Cockroaches	unknown	20	15
Fish	*Glanyops hanitschii*	20	10
Large tadpoles	*Leptobrachium montanum*	30	3
Small tadpoles	*Rana signata*	10	0
	Meristogenys orphnocnemis	10	0

yops hanitschii, and an unidentified species of cockroach. During each trial all spiders were given the same three prey. Live prey were placed in shallow, plastic trays (10 × 15 × 1 cm) filled with water on the floor of each cage. Cockroaches were released on the floor of the cage. We observed behavior of the spiders for up to 1 hour following the initiation of a feeding trial. We recorded attack, capture and prey handling behaviors.

Between trials, spiders consistently oriented themselves above shallow trays of water in their cages. Spiders rested vertically on cage walls, facing downward, with their pedipalps and two front appendages resting lightly in the water. During cafeteria trials, spiders remained motionless until movement of the prey elicited a predatory response. Spiders generally attacked prey in the water by quickly lurching forward and piercing the skin of the prey with their fangs. After a successful capture, spiders climbed the cage wall to begin prey manipulation. Spiders used the front appendages and chelicerae to "fold" the prey in half, using silk to reinforce the fold. Spiders then fastened the prey to the cage wall with silk, released hold of the prey, and began a stereotyped weaving procedure. Spiders straddled the prey and moved in a counter-clockwise direction, rotating the body 360° directly above the prey while encircling the prey with silk. The spiders continued weaving until prey items were wrapped in tight packages of silk. After prey capture and manipulation, spiders began feeding on the prey. Spiders generally completed feeding less than 24 hours after prey capture and discarded the shrunken body of the prey at the bottom of the cage.

In cafeteria trials, spiders consumed 75% of the cockroaches, 50% of the fish, and 10% of the large tadpoles (*L. montanum*) offered. Spiders did not capture or consume small tadpoles (*M. orphnocnemis* and *R. signata*). In trials with small and large tadpoles, spiders captured and consumed only large tadpoles. In trials with fish and large tadpoles, both prey were taken. In trials with cockroaches and tadpoles, or cockroaches and fish, spiders captured and consumed cockroaches.

Capture of cockroaches was significantly different from capture of aquatic vertebrate prey. Spiders were alerted by movement of the prey, and they attacked the prey with a swift and precise jump. One spider attacked a cockroach with a vertical jump of over 20 cm (pers. obs.). Spiders did not use silk to subdue invertebrate prey. No terrestrial attacks were observed in the field, although we observed one spider in the process of consuming a moth.

Hunting on the water surface has so far been reported from three spider families in various parts of the world (Pisauridae, Trechaleidae, and Lycosidae). Hunting on the water surface and feeding on aquatic and non-aquatic prey is known from three pisaurid genera; the worldwide *Dolomedes* Latreille 1804 (Bleckmann & Rovner 1984; Williams 1979), the African-Asian *Thalassius* Simon 1885 (Abraham 1923; Sierwald 1988), and the South American *Ancylometes* Bertkau 1880 (Schiapelli & Gerschman 1970); among the Trechaleidae it is known for members of the South American genus *Trechalea* Thorell 1869 (Berkum 1982). Among the Lycosidae, members of the genus *Pirata* Sundevall 1832 live in marshes and move over the water surface (Bristowe 1923; Ehlers 1939). Diving behavior is reported for *Dolomedes* species and *T. spinosissimus* (Sierwald 1988). This represents the first report of members of the family Sparassidae hunting on the water surface.

We are grateful to the Malaysian government for permission to work in Sabah. We thank the director of Sabah Parks, Datuk Lamri Ali and the deputy director, Francis Liew, for permission to work in Kinabalu Park and for temporary staff housing at the field site.

We thank Matthew Chatfield, Jacqueline Schlosser, and Frederick Francis for their valuable assistance in the field and laboratory. We gratefully acknowledge Peter Jäger confirming the genus identification. Field work was supported by grants from the Environmental Protection Agency Graduate Fellowship to Satie Airame and the GANN training grant to the Department of Ecology and Evolution at the University of Chicago.

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Manuscript received 24 February 1999, revised 10 December 1999.